5.3 Geology And Soils

5.3.1 Introduction

The Geology section of the EIR/EA analyzes the potential short-term, long-term, and cumulative impacts resulting from the construction and operation of the Proposed Project and alternatives. The geology discussion will analyze the geological conditions in the proposed Shingle Springs Interchange region.

5.3.2 Environmental Setting

Regional Geology

Low hills and rounded knobs ranging in elevation 1,400 feet (427 m) and 1,600 feet (488 m) above sea level (asl) characterize landforms that surround the project area. Low eroded bedrock features and shallow deposits of alluvial material control topography. At the project site, the Highway 50 road cut exposes the metamorphosed (altered through pressure and heat) volcanic rocks that are part of extensive, north-south trending metamorphic rock belts that underlie portions of the Sierra Foothills. Described as a melange belt, this chaotic mixture of metamorphic rocks was formed through prolonged heating and recrystallization of sedimentary rocks about 150 million years ago (Wagner, 1987). These formations were then intruded by molten magma that crystallized as large masses of granite. Specifically, the bedrock in this region is recognized as part of an island arc formed during mountain building of the Sierra Nevada between 136 and 190 million years ago (Loyd, 1983).

Project Site Geology

Metamorphosed volcanic rocks, recrystallized into greenstone schists and other altered igneous rocks, comprise the bedrock underlying the proposed interchange site [1]. This pressure and stress of metamorphism has resulted in numerous fractures and joints that tend in a nearly north direction and are tilted approximately vertical. Serpentinite, or rock containing the mineral serpentine, is abundant in the melange belts of the Sierra foothills, the Klamath Mountains and the Coast Ranges and is typically grayish-blue to bluish black in color sometimes having a greasy or shiny appearance.[2] Serpentinite, generally exposed near faults in the Sierra Foothills, occurs in western El Dorado County and has been mapped within the Proposed Project vicinity (Wagner, 1987). Shallow surficial deposits covering portions of the bedrock in the Proposed Project area are comprised of mixed alluvial sediments (cobbles, sand, silt, and clay) of varying depths.

1 Greenstone is an altered volcanic rock. Shists are crystalline metamorphic rocks commonly formed from fine-grained sedimentary rocks.

2 Serpentinite is a rock consisting almost entirely of serpentine and is derived from alteration of preexisting minerals. Serpentine is a name given to a mineral group that consists of lizardite, chrysotile, and antigorite.

A field survey identified serpentinite (rock containing serpentine minerals) at the west end of the interchange project site. On the north side of Route 50, serpentinite was observed within the road cut extending east about 275 feet (84 m). On the south side of Route 50, what appeared to be the continuation of the serpentinite unit, was visible extending east within the road cut for about 328 feet (100 m). The serpentinite exposures extend vertically, approximately 20 to 25 feet (6 - 7.6 m), from the roadway to the road cut crest.

Serpentine is a name given to a mineral group that consists of lizardite, chrysotile, and antigorite and serpentinite is a rock consisting almost entirely of the mineral serpentine derived from alteration of preexisting minerals.[3] Serpentinite is California's State Rock and is apple-green to black, often mottled with light and dark colored areas. Its surfaces often have a shiny or wax-like appearance and a slightly soapy feel. Serpentine is usually fine-grained and compact but may be granular, platy, or fibrous in appearance. Serpentine occurs in the Coast Ranges of central and northern California, in the Klamath Mountains, and in the Sierra Nevada foothills.

Asbestos is a term applied to a group of silicate minerals that readily separates into thin, strong, and flexible fibers that are heat resistant. Chrysotile in fibrous form is the most common type of asbestos and is often is present in serpentinite. In addition to serpentine minerals, other minerals such as talc, brucite, actinolite, carbonate minerals and magnetite may form as products of the serpentinization process.[4] Tremolite/actinolite asbestos is another common type of asbestos found in California and is found in most Sierra Nevada counties and Klamath Mountains associated with fault or shear zones in serpentinite. Lizardite and antigorite do not form asbestos fibers and instead are plate-like in form.

Because serpentine often contains some asbestos, and exposure to asbestos fibers have potential human-health consequences, the Air Resources Board adopted regulations in 1990 restricting the use of this rock type as an unpaved road surfacing material.

Soils

El Dorado County soils consist of well-drained silt and sandy and gravelly loams divided into two physiographic regions; the Lower and Middle Foothills and the Mountainous Uplands (USDA, 1974). The soils within the project vicinity belong to the Auburn series, which generally consists of well-drained soils underlain by metamorphic rock. Surficial soil overlying the site consist of Auburn very rocky, silt loam, (AxD) on 2 to 30 percent slopes and Auburn very rocky, silt loam (AxE), which is similar to AxD but is found on 30 to 50 percent slopes (**Table 5.3-1**). These soils have a slight to moderate erosion hazard, low expansive potential, and low corrosivity. The use of Auburn soils for road fill is rated fair due to the soils' tendency to erode

3 The term "serpentine" is commonly used by the general public to refer to the rock type that geologists call "serpentinite."

4 California Division of Mines and Geology, *Areas More Likely to Contain Natural Occurrences of Asbestos in Western El Dorado County, California*, Open-File Report 2000-002, 2000.

on slopes, the moderate to high potential frost action, and the low shrink-swell (expansive) capacity. Soils surrounding the Shingle Springs Rancheria include Serpentine Soil, Diamond Springs, and Auburn Silt Loam.

Table 5.3-1 Soils Within the Project Site

Soil Type/Capability Class[1]	Erosion Hazard	Shrink-Swell Potential
AxD AxE Auburn Very Rocky Silt Loam/VI	Slight to Moderate	Low

Source: USDA, Soil Conservation Service, 1974
[1]Capability Class related to choice of plants and conservation practices: I – Few limitations; II – moderate limitations; III – severe limitations; IV – very severe limitations; V – impractical to remove, best for pasture land; VI – severe limitations, unsuited for cultivation; VII – very severe limitations, unsuited for cultivation, VIII – soils and landforms have limitations that preclude use for commercial plants.

Soil Erosion

Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil material and structure, placement and human activity. Soil containing high amounts of silt can be easily erodible while sandy soils are less susceptible. Erosion is most likely on sloped areas with exposed soil, especially where unnatural slopes are created by cut and fill activities. Soil erosion rates can therefore be higher during the construction phase. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures or asphalt. The silty loam soils at the project site are considered to have a low to moderate erosion potential. However, the extensive excavation and grading associated with the Proposed Project could potentially result in soil erosion as hillsides are stripped of existing vegetation and the topography is recontoured during construction operations. Excessive soil erosion can eventually lead to damage of roadways and embankments.

Mineral Resources

The California Division of Mines and Geology (CDMG) classifies the regional significance of mineral resources in accordance with the California Surface Mining and Reclamation Act of 1975. Mineral Resource Zones (MRZ) have been designated to indicate the significance of mineral deposits. The MRZ categories are as follows:

MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2 Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.

MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.

MRZ-4 Areas where available information is inadequate for assignment to any other MRZ.

The El Dorado County General Plan Land Use Map does not identify the project site as a Mineral Resource (MR) area. There are mineral resource areas, primarily along the Deer Creek drainage, that are classed MRZ-3 for Placer gold and chromite deposits (CDMG, 1984). Deer Creek is located approximately 6 miles southwest of the project site.

Seismicity

Earthquakes on the various active and potentially active San Francisco Bay Area, Central Valley and Sierra Nevada fault systems are expected to produce a wide range of ground shaking intensities within the Shingle Springs area.[5] The 1997 Uniform Building Code (UBC) locates the project area within Seismic Risk Zone 3 meaning that risks from earthquakes are somewhat less compared to the San Francisco Bay Area that is considered within Seismic Risk Zone 4. For reference, the 1906 and 1989 earthquakes on the San Andreas Fault generated shaking in El Dorado County; however, local damage was limited.

Faults in the nearby vicinity are related to the Foothills Fault Zone, which includes the Bear Mountain Fault Zone and the Melones Fault Zone in the Sierra Nevada foothills located east of the Proposed Project area. In addition to these local faults, several large active earthquake faults are located in the Central Valley region, between 30 to 65 miles away, and in the San Francisco Bay Area, over 70 miles away. **Table 5.3-2** describes the location of nearby faults and provides information, where available, on the magnitude of the most recent activity on the faults. The estimated maximum (moment) magnitudes represent *characteristic* earthquakes on particular faults.[6]

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Future faulting is generally expected along different strands of the same fault (CDMG, 1997a). Ground rupture is

5 The State of California defines an active fault as a fault that has had surface displacement within Holocene time (approximately the last 10,000 years) defines. A *potentially active* fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. *Sufficiently active* is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).

6 Moment magnitude is related to the physical size of a fault rupture and movement across a fault. Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave. Moment magnitude provides a physically meaningful

considered more likely along active faults, which are referenced above. The Project site is not within an active fault rupture hazard zone as defined by the Alquist-Priolo Earthquake Fault Zoning Act (discussed below). Since no mapped active or potentially active faults are known to pass through the project site, the potential risk from fault rupture is considered low.

Table 5.3-2 Active and Potentially Active Regional Faults

Fault	Location to Shingle Springs	Recency of Faulting	Maximum Moment Magnitude Earthquake[B]
Foothills Fault Zone Bear Mountain FZ New Melones FZ	 2 miles W 6 miles E	1.8 mya - Present	6.5
Cleveland Hill	42 miles N	.01 mya - Present	6.5
Dunnigan Hills	46 miles WNW	11,000 - Present	6.3
Concord-Green Valley	72 miles SW	.01 mya - Present	6.9
Hunting Creek	78 miles WNW	11,000 - Present	6.9
Rio Vista	44 miles SW	1.8 mya - Present	NA
Stampede Valley	57 miles E	1.8 mya - Present	NA
Genoa	59 miles E	11,000 - Present	NA
Vaca Fault	46 miles W	1.8 mya - Present	NA

Source: Jennings, 1994, Bryant, 2000, Hart, 1997, Peterson, 1996.

A An active fault is defined by the State of California as a fault that has had surface displacement within Holocene time (approximately the last 10,000 years). A potentially active fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. Sufficiently active is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).

B The Maximum Moment Magnitude is an estimate of the size of a characteristic earthquake capable of occurring on a particular fault. Moment magnitude is related to the physical size of a fault rupture and movement across a fault. The Maximum Moment Magnitude Earthquake (Mw), derived from the joint CDMG/USGS Probabilistic Seismic Hazard Assessment for the State of California, 1996. (CDMG OFR 96-08 and USGS OFR 96-706).

mya= Million Years Ago

Ground Shaking

Ground shaking can be described in terms of peak acceleration, peak velocity, and displacement of the ground.[7] Areas that are underlain by bedrock, such as the project site, tend to experience less amplification of ground shaking than those underlain by unconsolidated sediments such as alluvial materials or artificial fill. Ground shaking may affect areas for hundreds of miles around a fault. According to CDMG Probabilistic Seismic Hazard Maps (10% probability of exceedance in 50 years), maximum peak ground acceleration in the Shingle Springs area during an

7 Peak Ground Acceleration is the maximum horizontal ground movement expressed as acceleration due to gravity or approximately 980 centimeters per second.

earthquake on one of the active or potentially active Bay Area, Central Valley, or Sierra faults could range from 0.1g to 0.2g[8] (Peterson, et.al, 1996). The probability level estimated by the CDMG maps provides engineers criteria to design buildings for larger ground motions than seismologists believe will occur during a 50-year interval, thereby making buildings safer than if they were only designed for the ground motions that are expected to occur in the next 50 years (see footnote 6; CDMG, 1999). For reference, the peak ground acceleration actually recorded at the epicenter of the 1989 Loma Prieta earthquake in Santa Cruz was 0.64g and the highest peak ground acceleration recorded on the San Francisco Peninsula for that earthquake was 0.33g. In comparison, the Caltrans Seismic Hazard Map estimates the region encompassing the Project site could experience a maximum peak ground acceleration of 0.5g (Caltrans, 1996). The Caltrans values are higher because the method Caltrans engineers use to estimate ground motion is inherently conservative, in consideration of public safety and critical structures such as highway bridges (Caltrans, 1996).

The Modified Mercalli Intensity (MMI) scale (**Table 5.3-3**) is a common measure of earthquake effects due to ground shaking intensity. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage.[9] Maximum peak ground acceleration intensities at the site are expected to cause strong MMI (VII) ground shaking. Ground shaking effects of this intensity include moderate structural damage to ordinary buildings, but negligible damage to buildings of good design and construction.

Landslides

A landslide is a mass of rock, soil, and debris displaced down-slope by sliding, flowing, or falling. The susceptibility of land (slope) failure is dependent on slope and geologic characteristics, as well as the amount of rainfall and the nature of excavation or seismic activities. Areas with steep slopes and downslope creep of surface materials are most susceptible to landsliding. Landslides are least likely in areas of low relief, such as topographically low alluvial fans. Slope instability and landslides can occur from construction activities and grading

8 "A probabilistic seismic hazard map is a map that shows the hazard from earthquakes that geologists and seismologists agree could occur in California. It is probabilistic in the sense that the analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. The maps are typically expressed in terms of probability of exceeding a certain ground motion. For example, maps illustrating the 10% probability of exceedance in 50 years depict an annual probability of 1 in 475 of being exceeded each year. This level of ground shaking has been used for designing buildings in high seismic areas. The maps for 10% probability of exceedance in 50 years show ground motions that seismologists do not think will be exceeded in the next 50 years. In fact, there is a 90% chance that these ground motions will NOT be exceeded. Seismic shaking maps are prepared using consensus information on historical earthquakes and faults. These levels of ground shaking are used primarily for estimating potential economic losses and preparing emergency response" (CDMG, 1999).

9 The damage level represents the estimated overall level of damage that will occur for various MM intensity levels. The damage, however, will not be uniform. Some buildings will experience substantially more damage than this overall level, and others will experience substantially less damage. Not all buildings perform identically in an earthquake. The age, material, type, method of construction, size, and shape of a building all affect its performance (ABAG, 1998).

operations on hillsides. Removing the lower portion (the toe) of a slope decreases or eliminates the support that opposes lateral motion in a slope. Newly graded slopes can be subject to landslide hazards from over-steepened slope construction, or by seismic ground shaking.

Table 5.3-3 Modified Mercalli Intensity Scale

Intensity Value	Intensity Description	Average Peak Acceleration
I.	Not felt except by a very few persons under especially favorable circumstances.	< 0.0015 g
II.	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	< 0.0015 g
III.	Felt quite noticeably indoors, especially on upper floors of buildings, but many persons do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to a passing of a truck. Duration estimated.	< 0.0015 g
IV.	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.015 g-0.02 g[a]
V.	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.	0.03 g-0.04 g
VI.	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.	0.06 g-0.07 g
VII.	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.10 g-0.15 g
VIII.	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.25 g-0.30 g
IX.	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.50 g-0.55 g
X.	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 0.60 g
XI.	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 0.60 g
XII.	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 0.60 g

Source: Bolt, Bruce A., *Earthquakes*, W. H. Freeman and Company, New York, 1988

[a]g is gravity = 980 centimeters per second squared. Acceleration is scaled against acceleration due to gravity or the acceleration with which a ball falls if released at rest in a vacuum (1.0g). Acceleration of 1.0g is equivalent to a car traveling 100 meters (328 feet) from rest in 4.5 seconds.

5.3.3 Regulatory Setting

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture is not necessarily restricted to the area within an Alquist-Priolo Zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design.

California Building Code

The California Building Code is another name for the body of regulations known as the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code (CBSC, 1995). Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable (Bolt, 1988). Published by the International Conference of Building Officials, the Uniform Building Code is a widely adopted model building code in the United States. The California Building Code incorporates by reference the Uniform Building Code (UBC) with necessary California amendments. About one-third of the text within the California Building Code has been tailored for California earthquake conditions (ICBO, 1997).

El Dorado County

The County has rules and regulations to minimize potential erosion hazards associated with construction activities, as described in Chapter 15.14 (Grading, Erosion, and Sediment Control) of the El Dorado County Code. In addition, the Public Health, Safety and Noise Element of the

El Dorado General Plan contains goals, policies and objectives to protect people and structures from geologic and seismic hazards.

California Department of Transportation

Jurisdiction of the California Department of Transportation (Caltrans) includes state and interstate routes within California. Any work within the right-of-way of a federal or state transportation corridor is subject to Caltrans regulations governing allowable actions and modifications to the right-of-way. Caltrans standards incorporate the UBC and California Building Code, and contain numerous rules and regulations to protect the public from seismic hazards such as surface fault rupture, and ground shaking. In addition, Caltrans standards require that projects are constructed to minimize potential hazards associated with cut and fill operations, grading, slope instability, and expansive or corrosive soils, as described in the Caltrans Highway Design Manual (HDM).

5.3.4 Impacts And Mitigation Measures

Significance Criteria

A soils or geologic impact would be considered significant if it would result in any of the following:

- Substantial flooding, erosion, or siltation,
- Exposure of people or structures to geologic hazards, soils and/or seismic conditions so unfavorable that they could not be overcome by special design using reasonable construction and/or maintenance practices.
- Construction on substrate that consists of material subject to liquefaction in the event of ground shaking.
- Construction on excessively steep slopes that could result in slope failure or landslides.
- Deformed foundations from exposure to expansive soils (those characterized by shrink-swell potential).

Methodology

Potential geologic and seismic hazards were assessed. The project site and alternatives were evaluated for consistency with adopted plans and policies, and ordinances, as well as compliance with federal, state and local rules and regulations.

Impact/ Mitigation

Impact 5.3-1 Seismic Groundshaking

AA Under the No Project/Action Alternative, the interchange would not be constructed, and no slope excavation or grading would occur. ***No impact*** will occur under the No Project/Action Alternative.

AB, AC In the event of an earthquake on one of the active or potentially active earthquake faults in the San Francisco Bay region, Central Valley, or the Sierra Nevada, seismic hazards related to ground shaking could occur in the Shingle Springs area. Ground shaking could result in damage and temporary closure of the freeway interchange, and portions of the access roadway. Although ground shaking is anticipated during the life of the project, the ground motions are likely to be less pronounced due to the underlying bedrock at the proposed interchange site. Furthermore, constructing the proposed interchange foundations in competent bedrock would also minimize the potential for failure due to weak or liquefiable soils. Regardless, construction of the Flyover Interchange Design or Diamond Interchange Design will be required to comply with engineering requirements set forth by the Caltrans Seismic Design Criteria that apply conservative estimates of ground motion, restricts construction if underlying geologic (i.e. liquefaction susceptibility) conditions are unacceptable, and integrates appropriate foundation designs. Given that this alternative would incorporate Caltrans engineering criteria, the proposed Flyover interchange is expected to withstand seismic shaking from an earthquake on the regional active and potentially active faults. ***The Flyover Interchange Design Alternative and the Diamond Interchange Design Alternative will not result in a significant impact to the environment from hazards associated with earthquakes or seismic ground shaking.***

Mitigation 5.3-1 Seismic Groundshaking

None Required.

Impact 5.3-2 Slope Instability And Landslide Hazards

AA Under the No Project/Action Alternative, the interchange would not be constructed, and no slope excavation or grading would occur. ***No impact*** will occur under the No Project/Action Alternative.

AB, AC Construction of the proposed on- and off-ramps for Flyover Interchange Design Alternative and Diamond Interchange Design Alternative would require hillside excavation and grading, and would include construction of a tie-back wall and retaining wall to provide structural support of the bedrock, especially in areas with jointing or fracturing rock. As required by the HDM, a geotechnical design report (GDR) will be prepared for the Proposed Project by Caltrans, or by an independent consultant subject to Caltrans over-sight and technical review. The GDR will include a site-specific geotechnical analysis and provide recommendations and guidelines for all earthwork associated with the project, including slope excavation, tie-back and retaining wall design, and final slope configuration. The development of the proposed Flyover interchange design alternative and Diamond interchange design alternative would be required to comply with Caltrans, and where applicable El Dorado County grading ordinances and UBC standards for design and construction. Compliance with these standards would reduce potential hazards associated with slope instability or landsliding to a less than significant level. ***The Flyover Interchange Design Alternative and Diamond Interchange Design Alternative will not result in a significant impact to the environment as related to slope instability and landslide hazards.***

Mitigation 5.3-2 Slope Instability and Landslide Hazards

None Required.

Impact 5.3-3 Soil Erosion

AA Under the No Project/Action Alternative, the interchange would not be constructed, and no slope excavation or grading would occur. ***No impact*** will occur under the No Project/Action Alternative.

AB, AC Soil erosion hazards could occur during preliminary stages of construction, especially during initial site grading and slope excavation, and prior to construction of the tie-back wall, retaining wall, and paving. In addition to causing sedimentation problems in storm drain systems, rapid water erosion could remove large amounts of topsoil, cause deeply incised gullies on slopes, and undermine paved surfaces. These potential soil erosion hazards would be addressed through compliance with Caltrans standards and construction BMP's required through the NPDES permit. Following standard, site-specific geotechnical engineering studies performed during the design stage, the Caltrans GDR would include erosion control features to be implemented during construction activities. Furthermore, the Proposed Project would be required to comply with grading, erosion and sediment control standards of the El Dorado County Municipal Code (Chapter 15.14), and applicable codes and requirements of the 1997 UBC with California additions (Title 22). Compliance with these standards would reduce potential hazards associated with soil erosion to a less than significant level. ***The Flyover Interchange Design Alternative and Diamond Interchange Design Alternative are not expected to result in a significant impact to the environment as related to soil erosion.***

Mitigation 5.3-3 Soil Erosion

None Required.

Impact 5.3-4 Excavation of Serpentinite

AA Under the No Project/Action Alternative, the interchange would not be constructed, and no serpentinite would be encountered. ***No impact*** will result from the No Project/Action Alternative.

AB, AC Serpentinite, generally exposed near faults in the Sierra Foothills, occurs in western El Dorado County and has been mapped within the Proposed Project vicinity. Because serpentine often contains some asbestos, and exposure to asbestos fibers have potential human-health consequences, the Air Resources Board adopted regulations in 1990 restricting the use of this rock type as an unpaved road surfacing material. West-bound on-ramp and east-bound off-ramp construction would likely encounter serpentinite (at the west end of the interchange project site) if the road cut slopes on either side of the highway require ripping, grading, drilling or excavation. ***The Flyover Interchange Design Alternative and Diamond Interchange Design Alternative are expected to result in an excavation of rock containing serpentinite, which is considered a significant but mitigable air quality impact.***

Mitigation 5.3-4 Excavation of Serpentinite

The impact identified above will be reduced to a ***less-than-significant*** level with the implementation of the following mitigation:

(A) This impact would be reduced to a less-than-significant level by complying with Chapter 8.44 of Title 8 of the El Dorado County Ordinance Code, “Naturally Occurring Asbestos and Dust Protection Ordinance”. Section 8.44.030 of this ordinance specifically addresses “General Requirements for Grading, Excavation and Construction Activities”.

Section 8.44.030 requires the following:

- An Asbestos Hazard Dust Mitigation Plan.
- Required construction practices, including: wetting work areas, limiting vehicle access, and covering areas with non-asbestos material.

These measures will reduce the potential for asbestos dust from becoming airborne and causing a health hazard.

Impact 5.3-5 Cumulative Impacts

AA The No Project/Action Alternative will not contribute to cumulative geology and soil impacts. ***No cumulative impact*** will result from the No Project/Action Alternative.

AB, AC The only project specific geology and soil impact identified is related to the excavation of serpentinite. The serpentinite impact is related to air quality emissions (asbestos). Cumulative development in El Dorado County may result in the excavation of serpentinite; however, compliance with county regulations would be required. The implementation of air quality Mitigation 5.5-2 will assure that Alternative B and C will not significantly add to the cumulative release of asbestos containing materials. ***Therefore, no cumulative geologic, soils, or seismic impacts are anticipated to occur as a result of the proposed interchange project.***

Mitigation 5.3-5 Cumulative Impacts

None required.